christening is not allowed until a certificate of vaccination is produced. So with schools, in which, although truancy is punished by fining or imprisoning parents, instead of punishing the truant, no child can enter one unless vaccinated, and yet every child is obliged to be sent to school. In America the child must be vaccinated before it can enter one; but how large is the number of children who are too young to enter, and how many of such are found among the weekly registration of deaths from smallpox?

LEUCOCYTHÆMIA.

[Translated for the Boston Medical and Surgical Journal from No. 29 of the *Allgemeine Wiener Zeitung* for 1858.—Continued from page 77.]

BY B. JOY JEFFRIES, M.D.

Anatomical and Microscopical Examination; by Dr. JULIUS KLOB.*

BODY of medium size, pale brownish fawn color, emaciated; hair of the head brown; pupils moderately opened; neck thin; chest small; abdominal parietes moderately distended. External genitalia slightly œdematous.

Scalp pale, calvarium of ordinary thickness, having, on the internal surface of either side of the sagittal suture, small depressions the size of a pea. The dura mater moderately stretched and pale; in the superior longitudinal sinus a little fluid, thin, dirty red blood, mixed with small, yellowish-white, soft coagula. On the inner surface of the dura mater, a soft, thin, jelly-like, yellowish deposit. The pia mater infiltrated with serum, rather free from blood, and studded with Pacinian corpuscles over the upper portion of the cerebral hemispheres. In its larger, moderately-distended veins, a thin, dirty, pale-red blood. The brain moist, the cortical substance a pale reddish brown; medullary substance rather a clean white color, of soft, pasty consistence, and moderately rich in blood. Lateral ventricles somewhat dilated, holding three drachms of a clear, yellowish serum. The lining membrane of the lateral ventricles soft; the vascular plexuses pale—the capillaries of the lateral ones distended into little branches filled with a thickened serum. Base of the skull pale. In the other sinuses also a thin, fluid blood, with yellowish flocculent coagula.

Mucous membrane of the mouth and fauces pale, strewed with flakes of loosened, whitish epithelium. The thyroid gland somewhat enlarged; in its right lobe several plainly circumscribed cysts, the size of a bean, filled with a soft, pale-brown tissue, shining like colloid. The arteria thyroidea superior dextra, three lines thick, a good deal twisted, the coats thickened. Mucous membrane of the larynx pale. Jugular veins strongly dilated. On cutting into

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the right jugular comitans, the blood passed out in the form of cylinders the size of the vein, which were very soft, surrounded by a little thin, fluid blood, of a dirty brownish-red color, and mixed with numerous pale yellowish red coagula, in the form of dots or streaks and lumps; so that the surface of these cylinders looked granulated, flaky and marbled. The blood in the neighborhood, a dirty, pale red, with a greasy, viscid feel. Both lungs free, their substance pale red, throughout moderately crepitant to the touch, and holding an average amount of blood, the posterior parts somewhat richer in blood than the anterior, filled throughout with rather a coarse, frothy, pale-red serum. On cutting into the pulmonary arteries, there flowed out blood similar to that from the vena jugul. communis, whilst the blood of the pulmonary veins was a dirty pale-red, thin and mixed with but few coagula. In the bronchi, some viscid, glairy mucus, the mucous membrane with pale red injection.

In the pericardium, about two ounces of clear, yellow serum, the heart dilated, flaccid, especially the right auricle, and the ventricle of this side in the form of the greatest diastolic enlargement. On opening the right ventricle, there flowed out a mass of dirty, yellowish-red blood in lumps, thickly mixed with such coagula as were in the jugular vein. In the left ventricle, an ounce of the same blood, but more red. The left auricle nearly empty, the right crowded with the same masses of blood as in the jugul. com. The muscular tissue of the heart itself rather a dark brownish-red, of normal consistency, the endocardium thin, the valves normal, the entrance and calibre of the large vessels of ordinary dimensions.

Upon opening the abdomen, the edge of the liver was seen reaching low down, as far as the spina. ant. sup. oss. ilei. The left lobe extended into the left hypochondrium, and there covered the upper portion of the spleen. The anterior edge of the spleen reached to the median line of the abdomen, the inferior edge to the spina. ant. sup. oss. ilei sin., so that between the liver and spleen, below the navel, was a triangular space, in which were seen coils of the small intestine, covered by the great omentum, and a part of the transverse colon. The right lobe of the liver a foot long, the two lobes fifteen inches across, the right four and a half inches thick. Surface of liver smooth and shining, its substance uncommonly succulent, a pale grayish-red and rather soft. Brownish gall in the gall-bladder. The spleen weighed five pounds two ounces (4 pfund 12 loth. Wiener. Gew.), was one foot long, five and a half inches broad in the upper half, three and a half inches thick, the lower half seven inches broad and two and a half thick, the anterior edge deeply notched; on its smooth surface, at one part, the capsule appeared to be torn, and the dark-red parenchyma pushing through. Substance of the spleen grayish-red, a section pretty uniform in texture, smooth; the Malpighian corpuscles here and there swollen, and appearing as whitish projections,

the trabeculæ pretty plainly hypertrophied, and the consistence of the spleen therefore moderately hard. Near the lower end, and on the anterior edge, were cuneiform, hæmorrhagic, fatty deposits the size of a bean, yellowish, compact and brittle.

The stomach and intestines only slightly distended with gases, the mucous membrane pale; in the stomach viscid mucus—in the intestines grayish and grayish-brown mucous fæces. The aggregate as well as the solitary glands of the canal, and the mesenteric glands, not swollen. The retro-peritoneal glands, however, especially those lying in front of the lumbar vertebræ, pretty plainly enlarged, forming pale grayish-white tumors the size of a bean, their pale cortical substance differing from the grayish-red central portion; the enlargement belonging especially to the cortical substance, which, when pressed, exudes a whitish pulp.

The kidneys feel swollen, yet scarcely enlarged, their cortical substance yellowish-red, in the pyramids dark red and hard. Bladder contracted, and holding a few drachms of clear urine. Uterus somewhat enlarged, the veins dilated and filled with a pus-like blood. Ovaries shrunken.

The microscopic examination of the spleen showed a simple hypertrophy—nothing else could be found than its strong, broad trabeculæ, accumulated, colorless cells, 0.003 to 0.007 lines in diameter, and the peculiar, spindle-shaped cells of the spleen. The yellowish, thick and brittle cuneiform deposits proved to be composed of the substance of the spleen in a state of fatty degeneration, broken down fibrous tissue, and a fine molecular hæmorrhagic deposit.

The liver appeared, under the microscope, normal, namely, no perceptible alteration in its cells. The most careful examination of the surface of the liver and of a section, both with the naked eye and with a lens, did not discover the white granules spoken of by Virchow (Ges. Abhandl., page 207). Yet fine sections, under the microscope, showed small collections (0.5 lines broad) of a few colorless cells and nuclei, in size 0.0027 to 0.0034 lines. No apparent alteration in the kidneys.

The swollen retro-peritoneal glands were often, in their cortical substance, of three to five lines in thickness. They appeared uniformly pale, holding cells 0.0042 to 0.0051 lines in diameter, and nuclei 0.0030 to 0.0039 lines.

I undertook to calculate the corpuscles in the blood taken from the different vessels of the cadaver (12 hours after death); previously convinced, however, that the result would be very uncertain and not at all a standard, on account of the separation that had already taken place of the different elements of the blood. The examination soon convinced me of the uselessness of my attempt. As, however, I subjected the fluid as well as the coagulated portions to repeated calculations, I will give an approximate comparison of the relation of the white elements to the red, as seemed

probable to me from the many different results. The splenic veins appeared to hold the most colorless elements; I should judge they were one half of the whole amount present. The splenic arteries carried blood not so rich in colorless blood-corpuscles as the veins. In the blood of the veins of the liver and of the pulmonary arteries, the white corpuscles appeared to me to amount to one half, whilst in the blood of the left side of the heart to one third of all present.

In general, the blood held, besides the normal red corpuscles, colorless cells 0.0078 to 0.014 lines in diameter, which appeared partly globular, but the majority somewhat oblong, the long diameter 0.002 lines more than the short diameter. The cell nuclei were large, round, and 0.0027 to 0.0053 lines in diameter, so that in some of the smaller oblong cells they appeared as large as the short diameter of the cell. The cells held nuclei partly of this description and partly oblong or biscuit shaped, about dividing. Three or four smaller nuclei were often seen in the cells, especially in the splenic veins.

There were also quite a number of free nuclei mixed with the cells, of the size and shape of the simple cell nuclei. I should estimate 10 or 15 free nuclei to every 100 colorless cells.

Chemical Examination; by Dr. FOLWARCZNY.*

The chemical examination is divided into two parts, namely, that of the blood taken during life by venesection and the bleeding of leech-bites, and that from the cadaver.

A chemical examination of leukæmic blood, to have any claim to scientific value, will be best and most simply made by Prof. Scherer's method.

Scherer found, among other soluble constituents of the pulp of the spleen, hypoxanthin, uric acid, lactic acid, leucine, formic acid, and acetic acid. On careful examination of blood from the cadaver, in two cases of leukæmia, he found the above substances, together with glutin, and fully corroborated the opinion which Virchow gave in 1851, that the extraordinary alteration of the blood in leukæmia was in part due to its being contaminated by the elements of the spleen.

Scherer proposed a peculiar method of analysis. This we were enabled to follow exactly, in the examination of the blood from the cadaver, whilst the blood from the venesection, and partly also that from the bleeding of the leech-bites, was also examined, in divided portions, for the above-mentioned elements.

Examination of the Blood taken during Life.—(*a*) Blood from the venesection.

A part of this blood, which did not well divide into clot and serum, was shaken up, and another portion set aside in order to obtain some clear serum after the more complete settling of the clot.

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A small portion of the blood that had been shaken up was coagulated in boiling water, a drop of acetic acid added to completely remove the proteinate, and then placed on a filter. The clear filtrate was divided into two portions.

In one portion, after long cooling, there was no glutinous coagulation, nor was there any cloudiness, such as occurs with glutinous solutions, on the addition of spirits of wine. *Glutin, therefore, was not present.*

The other portion was first strongly concentrated, and then by drying it with nitric acid on a platina spatula, a pale-yellow flake was obtained, which scarcely reddened on adding liquor potassæ, and did not on warming give the violet color of the hypoxanthin reaction. *Hypoxanthin was therefore not present.*

A further portion of the blood that had been shaken up, was mixed with five times as much distilled water, and then a few drops of concentrated sulphuric acid added, and the whole carefully distilled.

The distillate was clear as water, and had a weak acid re-action. It was neutralized with carbonate of soda, concentrated, and then with diluted sulphuric acid again distilled.

A portion of the distillate was treated with nitrate of oxide of silver and warmed; reaction at once took place, the mixture turning black. *Formic acid was therefore present.*

Another portion of the distillate was mixed with alcohol and sulphuric acid, and on heating, gave out a smell of acetic ether, although not strong.

Possibly, therefore, a minute portion of acetic acid may have been present.

The more or less clear serum obtained from the blood that had been standing, was evaporated on a water bath, and the remainder extracted with an alcoholic solution of oxalic acid. The lactic acid present would hereby be dissolved. The solution was then digested with an excess of oxide of lead, and filtered. This filtrate, which might have held lactate of the oxide of lead, was treated with sulphuretted hydrogen. This new filtrate could then only hold *free* lactic acid. It was then boiled with oxide of zinc, again filtered, and the filtrate brought to crystallization.

The peculiar club-shaped crystals of lactate of oxide of zinc were produced. The analysis thus proved the existence of lactic and formic acid. The presence of acetic acid was doubtful. Glutin and hypoxanthin were not present.

(*b*) Blood from the bleeding of leech-bites.

Lactic and formic acid were found. On evaporating the filtrate, obtained from boiling the coagulated mass of blood, were found in addition, beautiful crystal of tyrosin. Glutin, leucine, hypoxanthin were not found. The presence of acetic acid could not be determined, because a drop of this acid had to be added to cause complete coagulation.

Examination of the Blood from Cadaver.

The following were examined. (*a*) Blood from the splenic veins.
(*b*) do. do. veins of the liver.
(*c*) do. do. jugular vein and right side of the heart.
(*d*) do. do. aorta and left side of the heart.

We give here, first, the general result of the examination, and, at the end, that of the different portions of blood.

The portion to be examined was thoroughly triturated, so that it was of more or less uniform consistence, then the necessary quantity of distilled water added, and the whole boiled for some time. After careful cooling and settling it was filtered, and the clear filtrate tested for proteinate. If it had been completely freed from it (if necessary a drop of acetic acid must be added before filtering), the filtrate was brought to the consistence of a thin syrup, and kept cold several days. The presence of glutin was then proved by the gelatinous coagula and precipitate of the fluid with alcohol. Scherer found in the bottom of the evaporating dish a yellowish-white residue. The fluid is to be decanted and set aside, the yellowish-white precipitate washed on the filter, and now tested for uric acid and hypoxanthin.

The best way is to treat the dry yellowish powder with ammonia. Any hypoxanthin that may happen to be present is dissolved out, and uric acid falls as urate of ammonia. The remaining insoluble portion will be now tested for uric acid by the murexyd test. The ammoniacal solution is to be left to evaporate naturally, and the residue tested for hypoxanthin with nitric acid and liquor potassæ.

The fluid that was decanted from the yellowish white precipitate, and had been set aside, is somewhat further evaporated, and to it added a drop of the fluid concentrated by natural evaporation; the residue is then to be carefully examined under the microscope. Scherer found chloride of sodium and globules of leucine.

The fluid will now be evaporated to a thick syrup, dissolved in a little water, and mixed with absolute alcohol. Some leucine then crystallizes on the sides of the glass. The alcoholic solution of leucine is decanted from the uncrystallizable precipitate and divided into two portions.

One portion will be treated with a solution of nitrate of the oxide of silver, whereby a greater part of the added salts of silver being insoluble in nitric acid, will be thrown down as chloride of silver, yet the presence of formic acid will be shown by the quick reduction of the excess of nitrate of silver, on warming. The formation of crystals of the acetate of the oxide of silver, or the distillation of the fluid, with the addition of a few drops of concentrated sulphuric acid, and testing the distillate for acetic acid,

determines the presence of acetic acid in the blood under consideration.

To the other portion of the alcoholic solution will be added small amounts of concentrated sulphuric acid, till a white cloud is formed by the sulphate, from which it is to be filtered. The filtrate is to be boiled with the carbonate of lime, filtered, evaporated to dryness, extracted with alcohol, and to it a little ether added. The formation of crystallized lactate of lime proves the presence of lactic acid.

So much for the method of examining, and now follow the results with the separate portions of blood. Here has also been added a quantitative analysis of the blood from the splenic veins and aorta, for water and the incombustible salts.

(*a*) Blood from splenic veins.

In 1,000 parts. Water, 765.210
Solid substances, 234.790

1,000.000

Solid substances, 234.790. Inorganic, 11.692
Organic, 223.098

234.790

Glutin was not found. The murexyd test showed a small amount of uric acid. The hypoxanthin test gave a yellow flake that reddened with liquor potassæ, yet on warming it, only a slight tinge of violet was seen. The presence of hypoxanthin was therefore doubtful. Leucine was not found. Formic acid was present, but no acetic or lactic.

(*b*) Blood from the veins of the liver.

Formic and lactic acid were found; glutin, uric acid, hypoxanthin, leucine and acetic acid *not* found.

(*c*) Blood from the jugular vein and right side of the heart.

Uric and formic acid were met with; glutin, leucine, acetic and lactic acid and hypoxanthin could *not* be discovered.

(*d*) Blood from the aorta and left side of the heart.

In 1,000 parts. Water, 795.005
Solid substances, 204.995

1,000.000

Solid substances, 204.995. Of these, inorganic, 12.076
organic, 192.919

204.995

No glutin, uric acid, acetic acid or hypoxanthin were found, but formic acid, lactic acid, and a good deal of leucine in beautiful crystals, were met with.

We found, therefore, in leukæmic blood, no glutin in any examination; hypoxanthin and acetic acid only in one (splenic veins—V.

mediana), and then doubtful; uric acid in minute quantity in one examination (ven. jugul.); tyrosin and leucine each found once (capillary blood, aorta); formic acid in all cases; lactic acid in the greater number of experiments (ven. median, capillary blood, veins of the liver, aorta).

The quantitative analysis of the water and solid substances, and of the organic and inorganic constituents of the latter, scarcely differs from that of normal blood, as Scherer also found.

For the literature of the chemical examination of leukæmic blood, are to be mentioned, *Verhandlungen der phys. Medizinischen Gesellschaft in Würzburg*, Bd. II., No. 21, in Bd. VII., Heft. I.

ON DIPHTHERITIC PARALYSIS.

BY DR. MAINGAULT.

VARIOUS French authors have drawn attention to the fact that paralytic affections occur as sequelæ of diphtheria, or rather of the disease to which Bretonneau has given the name diphthérite. Dr. Maingault discusses the subject fully, and adduces numerous cases in illustration of his remarks. The following is a brief summary of the account which he gives:—Two or three weeks after all throat affection has disappeared, the first symptoms of paralysis show themselves; they are developed slowly; the patients may even have made considerable progress towards recovery before they occur. The first thing noticed is a paralytic affection of the soft palate, characterized by a difficulty of deglutition and a nasal speech—phenomena that may entirely disappear when the general muscular weakness shows itself. In some patients there is sudden emaciation. Vision becomes imperfect, and even complete blindness may supervene. The strength fails gradually; formication occurs in the extremities, accompanied by more or less severe pains in the joints. Walking becomes more and more painful, until the upright position is impossible. The paraplegia is then complete. The upper extremities partake in this weakness, the head becomes too heavy and sinks on the chest, the muscles of the trunk are incapable of sustaining the weight of the body. Strabismus, distortions of the face, dribbling, defective articulation, and paralysis of the bladder and rectum also supervene. There is an entire absence of fever, the pulse is small, and is reduced even to fifty; at the same time the heart's action is tumultuous, and there are anæmic murmurs. With these and other symptoms of defective innervation, the intellect remains intact, but the mental powers are sluggish. The disease may proceed to a fatal termination, or if it terminates favorably, the patient's strength returns gradually, and a cure is effected in a period varying from two to eight months.

Dr. Bouillon-Lagrange, in one of a series of articles on angine